# MEETING HELD AT BREWERS' HALL ON TUESDAY, 13TH FEBRUARY, 1900.

Mr. JOHN M. HANBURY (President) in the Chair.

Dr. G. HARRIS MORRIS demonstrated with the aid of a lantern a series of photomicrographical pictures of organisms met with in brewery practice, sent by Professor Paul Lindner, of the Technical Brewing School, Berlin.

Preceding the demonstration, Dr. Morris read the following explanatory note sent by Professor Lindner with the lantern slides:—

Since photomicrography, up till now, has been very little introduced into the art of brewing, I could think of no better contribution to this meeting than an exhibition of a collection of photographs, which I have prepared during the last few years. You will perceive in the course of the demonstration that photomicrography is an invaluable aid, both in regard to original study as well as for comparative investigations in connection with the art of making a perfect object.

In the future, no doubt, most large brewing establishments will be provided with arrangements for photomicrography, though even in 1896 I was very much surprised to find excellent photomicrographs exhibited by large Russian breweries at the Russian Industrial Exhibition in Nishney Novgorod, and I am certain that the combined efforts of scientific men in this special branch will be of incalculable value to those who are working practically with the microscope, so long as the pictures are well reproduced. These photographs being true copies of nature, it will be an easy matter to identify the various species met with in our microscopical observations. A simple pen-and-ink drawing never guarantees the identification in so convincing a manner as do photographs. Photomicrography is a very difficult art and requires the utmost patience, as well as a facile hand; whilst, on the contrary, it is comparatively easy to obtain a good microscopic object.

The greater number of the lantern slides I am about to show you are from objects prepared by my students; and it would perhaps interest you to know that from the number of about 100 students who are studying under me every term, and from each of whom I can obtain at any time 10 to 15 preparations, I have such a rich store of material always ready at hand that it is impossible for me to do justice to all of them.

The moulds, yeasts, and bacteria, which you will see, have been almost exclusively cultivated by the so-called "Tröpfchen-kultur" (droplet culture).

This "Tröpfchen-kultur" is especially adapted to permit an undisturbed development of the various microbes, as the liquid forms only a very thin layer, and consequently prevents every movement, a circumstance which differs from the old method of the hanging drop.

The whole growth is frequently seen in a perfectly uninjured condition, and shows the trunk, branches, and twigs united as they have grown, and even if a portion has been broken off, it lies in the immediate neighbourhood. The deeper the drop the more danger there is of the growth falling to pieces. The flatter and shallower the drop, the easier it is to observe the entire field. Care must, however, be taken that the germs do not lie too close together in the drop; otherwise, when they begin to sprout, they will overlap one another.

If the cover slip is greasy the drop easily becomes deep, and in order to avoid this the slip must be freed from excess of grease by passing it several times through a flame. Many organisms have the peculiarity that they grow out of the drop and draw the liquid with them along the surface of the cover slip—for example, some species of Oidium, moulds, and Mycoderma. This is very favourable for the purpose of photography, as you will observe in certain instances.

I have given these explanations in order to characterise the peculiarities of my photographs; for the rest, let them speak for themselves.

The pictures are grouped in the following order:—

(*a.*) Vegetable growths from sweet water.
(*b.*) Development of the barley corn plant.
(*c.*) Moulds }
(*d.*) Yeasts } found in brewery practice.
(*e.*) Bacteria }
(*f.*) Animals in fermented liquids.

## DISCUSSION.

Mr. CHAPMAN thought they ought to be much obliged to foreign members who sent contributions of this description. The photographs which had been shown must have entailed a great amount of labour in preparation. They were also much indebted to Dr. Morris for the very admirable way in which he had put the matter before them. He knew from experience how difficult it was to give an account of another man's work, and they must all feel that Dr. Morris had executed the task in a satisfactory manner. Professor Lindner had given them much that was valuable, and a good deal that was new, he ventured to think, to many of them. A point that occurred to him during the reading of the paper was the influence of temperature on the branching forms of the Saccharomycetes. He supposed that everybody who had been accustomed to examine forced beer sediments knew how frequently the various Saccharomycetes tended to break into long branching filamentous forms, very closely resembling mould mycelia. He had found that this was intensified by the passage of ozone through liquids. He could corroborate Professor Lindner with regard to the frequent occurrence of the *Mucor stolonifer* upon malt, but though it was a common mould it was very rarely referred to in text-books.

Mr. KIBBLE asked if Dr. Morris could give them any idea whether the mould occurring on malt which had been shown on the screen was green or red?

Dr. MORRIS said he thought Mr. Chapman would agree that this was a whitish mould, neither blue nor green.

Mr. CHAPMAN said in his experience it had a greyish colour.

Mr. ARTHUR R. LING said he would like to add his tribute to what Mr. Chapman had said, with regard to the interest and value of Professor Lindner's communication, and their indebtedness to Dr. Morris for the very lucid way in which he had explained the numerous photographs. The matter presented did not, of course, lend itself to discussion. As it was more in the nature of a demonstration than a paper, he feared they could do very little with it in the Journal, beyond the publication of a verbal description of the photographs. He believed that reproductions of most of the very beautiful photographs they had been shown were to be found in Professor Lindner's book *Microscopische Betriebskontrolle in den Gahrungsgewerben*. In the introductory remarks, read by Dr. Morris, the author's ingenious droplet-culture method had been referred to, which, according to recent statements, was almost universally employed in German zymotechnical laboratories for the preparation of single cell yeast. This method was not very well known in England, although in Germany it appeared to have practically ousted the more tedious yet, so far as yeasts were concerned, equally good method devised by Hansen.

Mr. H. GRAHAM ALDOUS remarked that it was an unfortunate fact that their finances would not admit of the reproduction in their Journal of the photographs they had been shown. As they got more funds he thought they should make a bold attempt to make at least a partial reproduction of a paper of this sort. He wished also to ask Dr. Morris whether the vinegar worm was part of the life-history of the vinegar fly, or, in other words, whether the vinegar fly was responsible for the worm. He put the question for this reason: in the summer, in drawing a glass of beer from a cask that had been "spiled" in its head, he found a worm in the glass, very much like that which had been shown that evening, and round the spile-hole were several small flies also congregated. He thought perhaps the fly had produced this worm, which might have been caught up by the beer as it ran from the spile-hole.

Dr. MORRIS said there was no connection between the two, but he had often found in taps that had not been kept clean, and round the spile-hole, a growth of worms that were probably the same as the vinegar worm.

Mr. M. J. CANNON said that whilst the vinegar fly was constantly about acetifying houses, and they were never free from it, the vinegar eel was a trouble they could guard against, and one which did not very often occur in vinegar. He would like to add his tribute of admiration of the very able paper which Dr. Lindner had given them. Only those who had done much in photomicrography could properly appreciate the time and labour which the preparation of such slides must entail. He had worked upon the subject himself, and he thought there was a moral to be drawn from the slides and the paper. It was a subject well worth the while of the younger members to take up. Most young brewers had a very good knowledge of the use of the microscope, and looked at their yeast from day to day, but very seldom a regular record was kept of any trouble that might crop up. Those of the younger brewers who had the time and a knowledge of photography could very well take up as a hobby photomicrography for the purpose of photographing disease organisms appearing from time to time. By registering the results so obtained, they would have pictures by them for comparison when trying to find out the reason for any fresh trouble, and how it had originated. He would strongly advise those who were lucky enough to have the necessary time and patience to take up the subject, and devote their attention to that line of work.

The PRESIDENT then proposed a vote of thanks to Professor Lindner for sending his slides over to this country. There would be an instruction to the Secretary to write to Dr. Lindner thanking him. The meeting should also pass a vote of thanks to Dr. Morris for the able manner in which he had explained the photographs.

Dr. MORRIS said he wished to say one word in connection with this paper by way of entering a defence on behalf of their own country. Dr. Lindner seemed rather to have assumed that Germany and the Continent were leading the way in this matter, but within his own personal knowledge photomicrography had been practised in several breweries in England for many years. He had ventured to bring down one or two slides of objects taken by himself more than fifteen years ago in a brewery with which he was then connected, where a very considerable record of brewing operations was kept by that means. Other breweries in the same town were then doing the same thing, so that, in this particular instance, he thought that those present, and the readers of the paper when it appeared in the Journal, must not be allowed to think that Germany was the pioneer in all progress. He had himself a very strong opinion that the brewers and brewery practice of the United Kingdom would compare very favourably with the brewers and the brewing practice of any country in the world. That was not, he knew, the orthodox view to take nowadays, but, nevertheless, it was his opinion, founded on a great deal of experience both at home and abroad.

Dr. Morris then exhibited several slides showing starches, yeasts, and sections of the barley corn.

Mr. ALDOUS proposed a vote of thanks to the President for having attended to take the Chair on such an inclement night.

The PRESIDENT, in acknowledging the compliment, said that no thanks were due to him as he was particularly interested in this subject, upon which he had done a little work himself.